Arsenic Treatment

Arsenic Experience

Effective remediation requires the ability to characterize site conditions using a combination of tools. Proper sampling, understanding arsenic chemistry, properly performing treatability tests, data interpretation, and modeling are critical to identifying the most cost-effective remediation approach. Addressing impacted sites in the most cost-effective manner can save millions in remediation dollars. TRC (formerly RMT) applies a solution-focused approach to hazardous substance site remediation projects. This involves the upfront integration of risk evaluation, long-term land use preferences, and overall site objectives into the remedial approach.

TRC has extensive knowledge of fate and transport of heavy metal contamination, as well as remedial action know-how. TRC will systematically and objectively evaluate all feasible commercially available treatment technologies. In addition, our scientists have spent years developing cost-effective means for rendering heavy metal contaminants nonhazardous, including arsenic. This research has resulted in a number of patented products that have been widely applied to heavy metal remediation sites across the country.

Properly performing treatability tests is a critical component in identifying the most cost-effective remediation approach. TRC has worked on hundreds of sites impacted with heavy metals. The following projects highlight our expertise with arsenic-impacted sites.

Former Lumber Company Site - Wisconsin

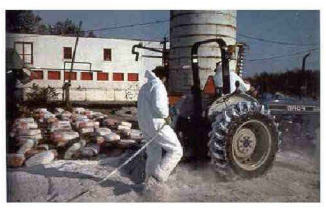
TRCs treatment chemicals helped turn this brownfields site into productive land.

Innovative Treatment for Arsenic Transforms Brownfield Site

Wisconsin's Taylor County inherited a Brownfields site comprised of approximately 45 acres in an otherwise prime location. The former landowner, Doberstein Lumber, had employed processes that used a wood preservative containing copper chromated arsenate. Over time, the copper chromated arsenate (CCA) residues seeped into the soil, causing significant impacts to the environment. The lumber company abandoned the property, and the land became a brownfields site. Arsenic levels in the soil of over 1,000 mg/kg in some areas required remedial action if the land was going to be used again.

This site presented unique stabilization challenges. Arsenic is susceptible to chemical and biological transformations in the environment, which can make the metal more mobile and difficult to treat. TRC used its proprietary treatment chemicals to stabilize approximately 2,400 tons of soil contaminated with CCA. Arsenic concentrations in the soil were reduced to below 0.005 mg/L and the treated material was left on-site. The *in situ* treatment process was quicker and more cost effective than excavating and removing the contaminated soil. (#5402)

Door County, State of Wisconsin Department of Natural Resources - Wisconsin



Application of TRC's Treatment Technology Using Conventional Earth Moving Equipment

In Situ Treatment of Pesticide-Impacted Orchard Soil

TRC was retained by the Wisconsin DNR through the State Environmental Repair Fund to investigate the extent of lead and arsenic contamination and to develop a remedial alternative. TRC collected soil samples to depths of 5 feet from pesticide mixing sites and from 34 orchard sites. Samples were analyzed for lead and arsenic composition. TRC developed analytical methods for lead and arsenic for use in the field, which allowed for faster analysis of the soil and minimized costly remobilization. A treatment chemistry was identified through bench-scale tests that proved effective in remediating mixing area soil contaminated with lead and arsenic to below TCLP limits, thus avoiding treatment permitting. TRC managed the remediation of the orchard soil using *in situ* treatment techniques. All treated soil met regulatory standards and was removed to a nonhazardous landfill. (#1068)

Arsenic Treatment

Former Fertilizer Manufacturing Site - Carteret, New Jersey

Treated Soil Reused at Challenging Site

This client was required to remediate 37,000 tons of soil with lead (up to 136,000 PPM) and arsenic (up to 54,000 PPM) as part of a phased remedial action plan. The 50-acre site was located in a complex area, which included industrial facilities, private residences, and a river. Working in a tidally influenced area also presented significant challenges, in addition to working in a zero-dust environment, treating lead and arsenic in a low pH environment, and managing material handling issues while working at depths of 8-16 feet. The project was performed during winter. A tidally influenced water table was controlled using a TRC designed and installed 30-foot deep sheet pile wall along the waterway. Soil was rendered nonhazardous and was reused on the site, saving the client approximately $1 million. (#5477)

S.S. Papadopulos & Associates - New Jersey

Treatability Studies Identify Effective Treatment Methods

The site was contaminated with arsenic and other pesticides as a result of pesticide manufacture and formulation at the site. TRC conducted treatability studies using nonproprietary additives, and evaluated the effectiveness of several proprietary processes to render the soil nonhazardous for arsenic. Two of the three soil samples could be rendered nonhazardous using stabilization technologies. (#2847)

AAA Property - Rhode Island

Arsenic-Impacted Soil Stabilized On-site

TRC assisted with the stabilization of 750 tons of arsenic-contaminated soil in existing stockpiles at a brownfield redevelopment project. Chemical handling and stabilization were accomplished utilizing conventional construction equipment. Stabilized material was used on-site as backfill. (#5454)

Former Ashepoo Fertilizer Works - Charleston, South Carolina

"We'd be hard pressed to think of a more aggressive approach for an aquifer."
—USEPA Region 4 Project Manager Craig Zeller

Significant Savings Realized at Metals-impacted Site

Historical practices at this former fertilizer plant resulted in spills that contaminated the soil and groundwater with acid, arsenic, and lead. Sampling found arsenic as high as 220 mg/L and lead as high as 18 mg/L. TRC managed the efforts of proprietary chemical treatment, including dosage determination, quality control, and on-site application support of URS and Conoco, for this $1 million CERCLA in *situ* arsenic and lead remediation project. Over 45,000 cubic yards of saturated affected soil were effectively treated *in situ* to below drinking water standards. The site was located in a tidally influenced coastal environment, and the project was hailed as a success by both the USEPA and Conoco. Using TRC's treatment chemicals *in situ* has allowed Conoco to avoid digging up, treating, and landfilling the soil. The application of the treatment chemicals saved the owner many years of monitoring associated with a reactive wall alternative and in excess of $1,000,000 associated with removal alternatives. (#5485)

Arsenic Treatment

AIG Technical Services, Inc. - Indianapolis, Indiana

TRC performed the fast-track cleanup at risk with a performance guarantee.

Expedited Property Transfer of Arsenic-impacted Site

TRC conducted the remedial investigation, remediation, and closure activities at a former wood preserving facility. Soil impacted with arsenic and chromium was treated with TRC's proprietary treatment chemical EnviroBlend®. After in-place treatment, the nonhazardous soil was excavated and disposed at a nonhazardous waste landfill. The addition of TRC's treatment chemicals only added about 2 percent bulk to the material (versus much larger bulk of more traditional treatment materials, such as Portland cement). AIG realized significant cost savings by disposing less material as nonhazardous versus hazardous waste. In addition, TRC completed a groundwater characterization and site-specific risk assessments for arsenic and chromium. TRC successfully demonstrated no adverse risk to human health or the environment. AIG realized cost savings estimated at $250,000 to $500,000 by not being required to implement an active groundwater remedy. This approach saved approximately 50 percent versus other alternatives. The client avoided extensive regulatory negotiations, allowing for an expedited site cleanup to facilitate the property transfer.

United Retek - Massachusetts

A novel approach of treating the accessible excavated area enhanced treatment in inaccessible surrounding soil.

Stabilization of Arsenic- and Lead-impacted Site

This site was impacted by arsenic- and lead-contaminated soil. TRC performed a treatability study to determine the most effective stabilization approach and application to reduce the TCLP concentrations of lead and arsenic to below 5.0 mg/L each and then designed a site-specific, multiple chemical methodology using TRC's treatment technologies. Chemical handling and stabilization were accomplished using conventional construction equipment. The Massachusetts Department of Environmental Protection approved a plan to treat sidewalls and the base of the excavation to enhance treatment of materials in surrounding soil. The material in these areas could not be excavated due to conditions of substructures. TRC successfully assisted with the stabilization of 1,500 tons of impacted soil above and below the groundwater table. (#5442)

Copper Smelting Facility - Australia

Treatment of Hazardous Smelter Sludge

TRC conducted treatability studies using our patented metals treatment technology to determine field dosages for the treatment of arsenic, cadmium, copper, lead, selenium, and zinc. Provided engineering oversight and technical support for pilot- and full-scale processing of more than 40,000 tons of sludge and contaminated soil. The total treatment cost was less than half of the cost of hazardous waste disposal. (#3973)

WisDOT, Fort Howard Avenue - DePere, Brown County, Wisconsin

Evaluation of Arsenic-impacted Soil for Beneficial Reuse

TRC reviewed and interpreted existing Phase I/Phase II data for this highway reconstruction. Developed conceptual approaches to dealing with fill materials containing elevated concentrations of heavy metals (arsenic). Negotiated the final approach with the WDNR. The results of this negotiation resulted in approval from the WDNR to incorporate approximately 700 yards of fill material with elevated concentrations of arsenic into "visual barriers." These visual barriers were large berms constructed in the right-of-way to shield motorists' view from adjacent railroad tracks. Assisted the WisDOT with the preparation of special provisions for the highway construction contract.

Arsenic Treatment

Industrial Waste Disposal NPL Site - South Carolina

Treated soil was constructively, saving disposal costs.

Treated Soil Reused on Site

TRC provided full-time construction management oversight during stabilization/solidification of more than 57,000 cubic yards of soil impacted by arsenic, cadmium, chromium, lead, mercury, and nickel. The site is surrounded by extensive residential development. Used advanced geostatistics and XRF analysis to focus the site excavation, and treat and handle only affected soil. Constructively reused treated soil, sludge, and waste. Treated soil was used as internal berms within the on-site landfill. Significantly reduced treatment of additional material by attributing the existing chromium to background sources. Performed the project for a final cost of $7 million versus the preliminary cost estimated at $12-25 million based on USEPA data. (#673)

Clow Water Systems - Coshocton, Ohio

Streamlined Remediation of Arsenic-Impacted Site

As a result of prior Orders from the Ohio EPA, this client was regularly performing unreasonable and expensive post-closure assessment monitoring, was required to close hazardous and exempt waste cells, and was required to complete a Corrective Measures Study for regulated units at its production facility. Resolution of these issues was complicated by inconsistencies in the Ohio regulatory requirements for the three different units. Furthermore, Clow wanted to avoid a pending change in the arsenic cleanup standard and hoped to use the surface of the closed exempt waste cell to expand existing pipe storage space.

To resolve the current challenge, TRC and Clow requested a working committee with District and Headquarter's staff from the Ohio EPA Divisions of Hazardous Waste Management, Solid and Infectious Waste Management, and Drinking and Ground Water, along with Ohio EPA legal staff, to ensure that a single solution would be approved by all parties. After months of meetings, negotiations, and a legal challenge, a solution was developed that integrated multiple agreements into a single Director's Final Findings and Orders (DFFO)—just prior to a new arsenic standard. The Groundwater Sampling and Analysis Plans would fall under the less stringent 50 µg/L standard. TRC installed a groundwater capture system, which is working fine with minimal maintenance issues. (#5809)

Arsenic Treatment

Wisconsin Department of Natural Resources, Former Rueping Leather Site - Fond du Lac, Wisconsin

Today, a once bankrupt tannery and contaminated site offering little value to the City is now a productive 8,000-square foot property redevelopment valued at more than $1.2 million.

Risk-based Solution Results in Site Redevelopment

Contamination from an abandoned 140-year-old tannery was impeding redevelopment of downtown Fond du Lac. The tannery was the suspected source of arsenic in a nearby municipal water well that was also contaminated with chromium. The City retained TRC to perform an initial environmental assessment of the 5.2-acre site. The State retained TRC under a state-led Superfund project to perform a remedial investigation/feasibility study (RI/FS) and risk assessment.

TRC conducted an RI to assess historical site development, soil/waste, groundwater, and surface water and determined that approximately one-third of the site was underlain by 49,000 yd^3 of waste materials and contaminated soil containing chromium and arsenic. The RI identified 16,000 cubic yards of highly contaminated waste and limited groundwater contamination, but did not link the site to the contamination found in the municipal well or to any potential impacts to the adjacent Fond du Lac River. TRC also conducted a risk assessment, which concluded that direct contact with the contaminated waste and/or groundwater could present a significant health risk if the tannery building was removed. The assessment also concluded that shallow groundwater discharge to a nearby river was unlikely to result in unacceptable risks to human health and the environment.

TRC completed an FS to evaluate a range of options from "no action" to "complete removal." The recommended remedy was to cover the contaminated soil and install a groundwater cutoff wall, at a total estimated cost of about $2 million. This provided a **"risk-based solution"** for the site. The contaminated portion of the site was contained and developed into an urban "green space." (#1643

Former Herbicide Blending Facility Superfund Site - Kansas City, Missouri

Alternative Treatment for Arsenic Provides Significant Cost Savings

TRC conducted treatability testing and developed an effective alternative chemistry that replaced Portland cement stabilization of arsenic, achieving an order of magnitude reduction in additive dosages. XRF analysis and available iron data were used to treat affected soil and optimize the stabilization additive dosage. A conventional excavator was used in chemical handling and soil stabilization. TRC provided technical support for full-scale processing of more than 70,000 tons of contaminated soil, which was disposed off-site. The treatment cost was lowered by an order of magnitude from the preliminary USEPA estimate of $50-100 million for dig-and-haul as hazardous waste. (#6327)

Arsenic Treatment

GNB Technologies - Tampa, Florida

Site During and After Remediation

Site Restoration of Metals-impacted Site

Air emissions from this client's battery recycling/smelting facility, along with waste disposal practices, resulted in contamination of off-site soil and sediment. The soil in adjacent residential neighborhoods was contaminated with metals, including arsenic and lead. Battery waste up to 12 feet deep was present in adjacent off-site properties, and over a mile-long stretch of creek sediment was contaminated with lead, cadmium, and arsenic. The client received a corrective action order to do a risk-based cleanup of the contaminated soil and sediment.

TRC treated the contaminated soil at the affected residences with our patented treatment chemicals, EnviroBlend® and then transported the treated soil to a nonhazardous landfill. After treatment, each yard was restored with new soil and landscaping. Over 15,000 cubic yards of contaminated soil and battery waste were removed from adjacent properties, including railroad and state highway rights-of-way. Restoration was conducted to meet stringent DOT requirements.

A detailed workplan and design was completed for the removal of contaminated creek sediment using a dam and water by-pass system so that sediment could be removed and confirmation sampling conducted under dry conditions. The client saved over $100,000 in removal costs because TRC was able to render the contaminated soil nonhazardous for disposal. Additional cost savings were gained by obtaining state approval that no confirmation sampling was appropriate for materials removed below the water table.